

Bell Work

31-Aug-2016

For example if you weigh out gold jewelry to sell for extra cash and the scale being used reads to the decigram (XXX.Xg) and you record 28.4g at a price of \$43.3/ gram, how much money should you get?

What if the actual weight was 28.44g, were you shorted?

Objective

You will be able to round number based on significant figure rules.

Significant figures

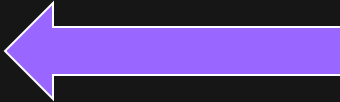
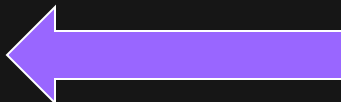
There are 2 kinds of numbers:

Exact: the amount of money in your account.
Known with certainty. Anything *COUNTED*

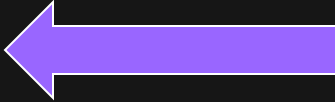
Approximate: weight, height—anything
Measured. No measurement is perfect.

Recall

A. Exact numbers are obtained by

1. using a measuring tool
2. counting 
3. definition 

B. Measured numbers are obtained by

1. using a measuring tool 
2. counting
3. definition

Practice

Classify each of the following as an exact or a measured number.

1 yard = 3 feet

The diameter of a red blood cell is 6×10^{-4} cm.

There are 6 hats on the shelf.

Gold melts at 1064°C .

When to use Sig Figs

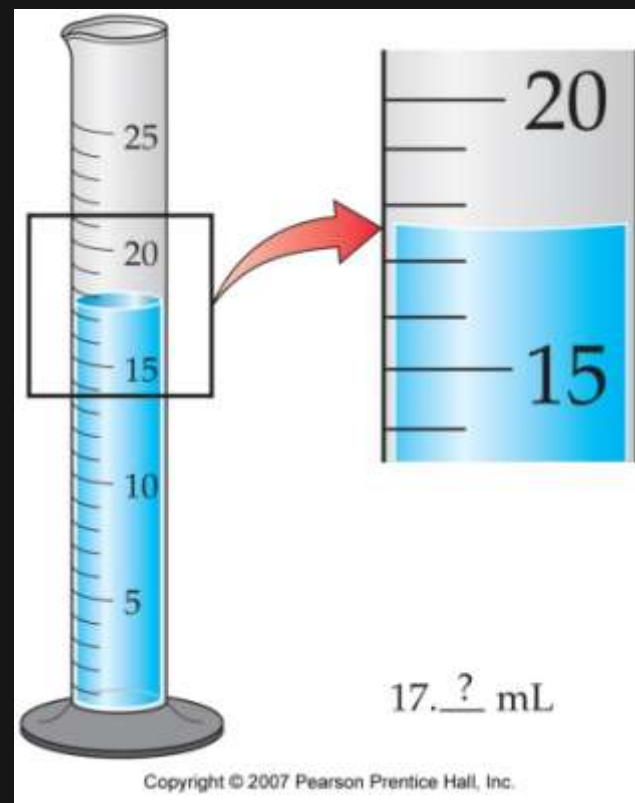
When a measurement is recorded only those digits that are **dependable** are written down.

Every experimental measurement has a degree of uncertainty.

The volume, V , at right is certain in the 10's place, $10\text{mL} < V < 20\text{mL}$

The 1's digit is also certain, $17\text{mL} < V < 18\text{mL}$

A best guess is needed for the tenths place.



Another Example

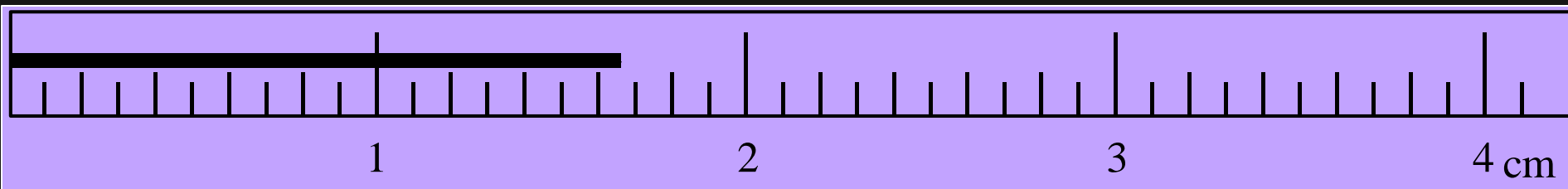
We can see the markings between 1.6-1.7cm

We can't see the markings between the 0.6-0.7

We must guess between 0.6 & 0.7

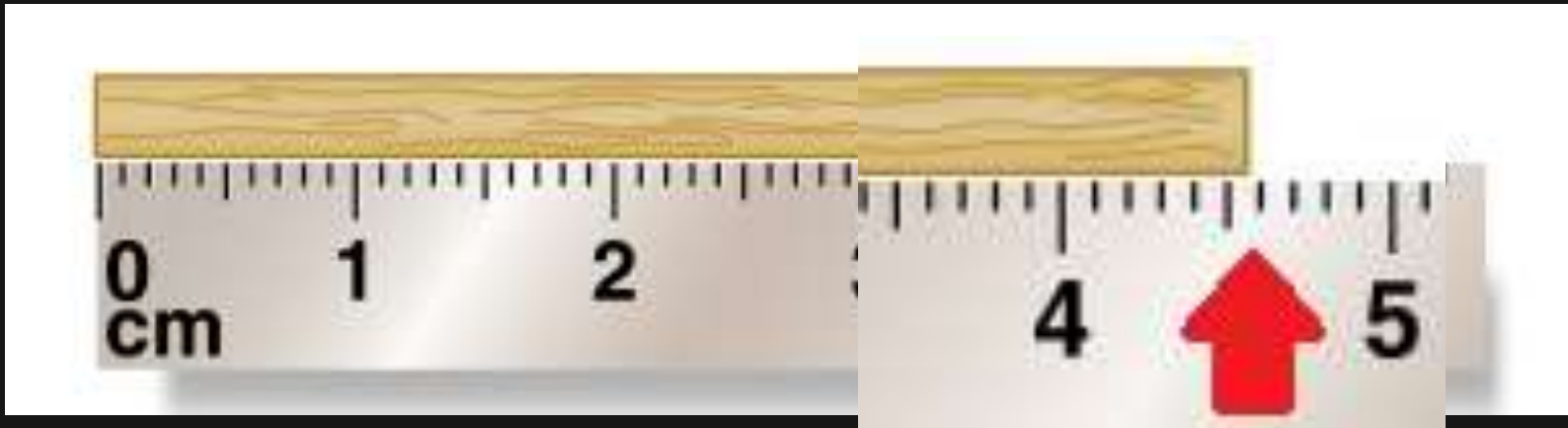
We record 1.67 cm as our measurement

The last digit an 7 was our guess...stop there



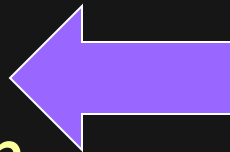
Your Turn

Measured Numbers have error...you have to make that Guess!



What is the length of the wooden stick?

- 1) 4.5 cm
- 2) 4.54 cm
- 3) 4.547 cm



Recorded Numbers

Uncertain digit
54.07 g A mass between 54.06 g and 54.08 g (± 0.01 g)

Uncertain digit
54.071 38 g A mass between 54.071 37 g and 54.071 39 g ($\pm 0.000\ 01$ g)

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All but one of the significant figures are known with certainty. The last sig. fig. is only to the best possible estimate.

To indicate the precision of a measurement, the value recorded should use all the digits known with certainty.

The Rules

RULE 1. Zeros in the middle of a number are like any other digit; they are always significant.

Ex. 45.081 g has **five** significant figures.

RULE 2. Zeros at the beginning of a number are not significant; they act only to locate the decimal point.

Ex. 0.0537 cm has **three** significant figures,
and **0.069 01 mL** has? **4**

The Rules cont.

RULE 3. Zeros at the end of a number and *after* the decimal point are significant. It is assumed that these zeros would not be shown unless they were significant.

Ex. 527.700 m has **six** significant figures.

If the value were known to only four significant figures, we would write 527.7 m.

The Rules cont.

RULE 4. Zeros at the end of a number and *before* an implied decimal point may or may not be significant. We cannot tell whether they are part of the measurement or whether they act only to locate the unwritten but implied decimal point.

Ex. 280 000km has 2 sig. figs.

How Many Sig Figs?

a. 45.8736

b. 0.000239

c. 0.00023900

d. 48000.

e. 48000

f. 3.982×10^6

g. 1.00040

Scientific Notation

When ever you are unsure – convert to scientific notation

$$215. = 2.15 \times 10^2$$



Decimal point is moved two places to the left, so exponent is 2.

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$$3.7962 \times 10^4 = 37,962$$


Positive exponent of 4, so decimal point is moved to the right four places.

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$$1.56 \times 10^{-8} = 0.000\ 000\ 015\ 6$$


Negative exponent of -8 , so decimal point is moved to the left eight places.

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Practice

1. Indicate how many significant figures there are in each of the following measured values.

246.32	5 sig figs	1.008	4 sig figs	700000	1 sig fig
107.854	6 sig figs	0.00340	3 sig figs	350.670	6 sig figs
100.3	4 sig figs	14.600	5 sig figs	1.0000	5 sig figs
0.678	3 sig figs	0.0001	1 sig fig	320001	6 sig figs

2. Calculate the answers to the appropriate number of significant figures.

$$\begin{array}{r} 32.567 \\ 135.0 \\ + 1.4567 \\ \hline 169.0 \end{array}$$

$$\begin{array}{r} 246.24 \\ 238.278 \\ + 98.3 \\ \hline 582.8 \end{array}$$

$$\begin{array}{r} 658.0 \\ 23.5478 \\ + 1345.29 \\ \hline 2026.8 \end{array}$$

3. Calculate the answers to the appropriate number of significant figures.

- | | | | |
|-----------------------------------|---------------|-------------------------|--|
| a) 23.7×3.8 | = <u>90.</u> | e) 43.678×64.1 | = <u>2.80×10^3</u> |
| b) 45.76×0.25 | = <u>11</u> | f) $1.678 / 0.42$ | = <u>4.0</u> |
| c) $81.04 \text{ g} \times 0.010$ | = <u>0.81</u> | g) $28.367 / 3.74$ | = <u>7.58</u> |
| d) 6.47×64.5 | = <u>417</u> | h) $4278 / 1.006$ | = <u>4252</u> |

Adding and Subtracting

Rule: When adding or subtracting measured numbers, the answer can have no more places after the decimal than the **Least** of the measured numbers.

Practice

$$5.45\text{cm} + 2.3\text{cm} = 7.75\text{cm},$$

$$\text{Round off to } = 7.8\text{cm}$$

You try:

$$7.432\text{cm} + 2\text{cm} =$$

$$9.432 \text{ round to } \rightarrow 9\text{cm}$$

Multiplications and Division

Rule: When multiplying or dividing, the result can have no more significant figures than the **least** reliable measurement.

Practice

$$56.78 \text{ cm} \times 2.45 \text{ cm} = 139.111 \text{ cm}^2$$

Round to $\rightarrow 139 \text{ cm}^2$

$$75.8 \text{ cm} \times 9.6 \text{ cm} = ?$$

Bell Work
1-Sept-2016 Pre - AP

What was the time you calculated to
count 1×10^6 ?

Was this a realistic number? Why?

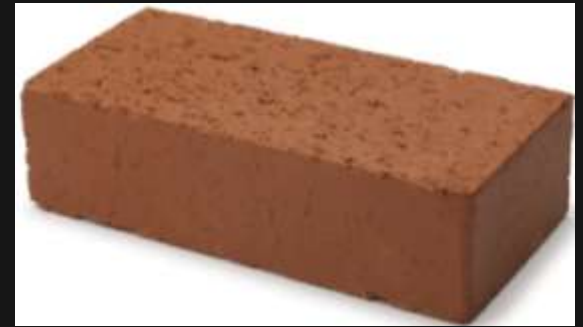
Objective

You will be able to determine the density of a metal after finding its mass and volume.

You will learn a fast method for finding volume.

Volume

How do you get the volume of a brick?



What about a rock?



Pre Lab

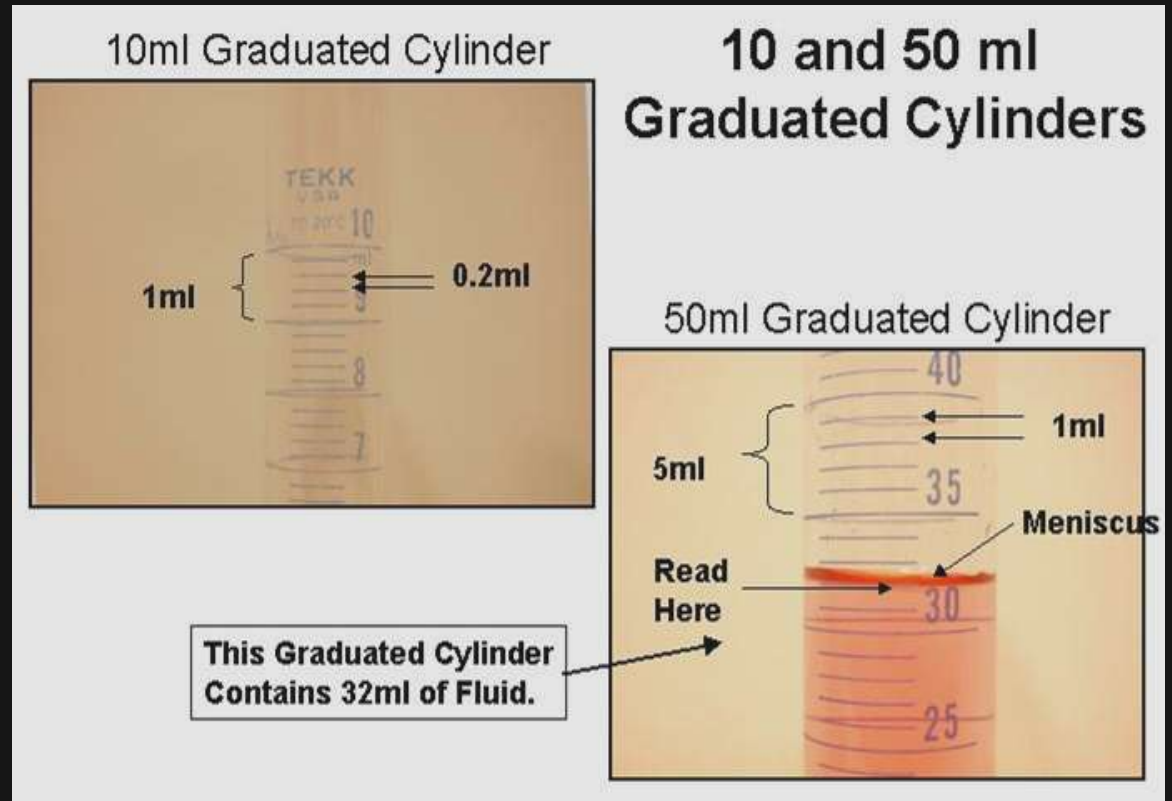
**Use as many
piece of paper
as you need, try
not to write on
both side.**

**Analysis and
conclusions
should be
recorded at the
end of the pre lab
after the lab**

Title							Name
							Period
							Date
Purpose/ Objective:							→
Safety:							→
Pre lab Calculations:							→
Procedures				Observations			
↓				↓			
Data Table:							

Reading a Graduated Cylinder

What do you think is the volume of the solution in your graduated cylinder?



Bell work

2-Sept-2016

How will you obtain mass of your samples?

List the specific steps needed to obtain the volume of the samples in the lab.

Density Lab

*There are **eight (8)** different metals, **A-H**,
you will work each and rotate through
the lab*

Each metal type needs a minimum of three (3)
different samplings of volume and mass.

Dry metals before weighing, all sphere metals
use weigh boats

Density Lab

Safety: **Do Not** touch the lead, Pb, with your fingers or hand. **No Toces El Plomo**

When using the **Pb** / "G" use 15 balls at a time.

So 15, 30, 45, _____ etc. when measuring

Follow directions!

When finished, record data on board for class to copy down for graphs.

Actual Density Values for percent Error

1. Person from each group:

**Please come up to board and enter any
one of your values you measured for
each sample**

2. Take a picture or look up data on class website in power point section

Average Vol. & Mass Period 1

Average Vol. & Mass Period 1

Mass

m³)

		B		C		D	
		Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)
9.1	10.2			6.0	1.0	9.5	2.0
10.6	9.0	1.6	0.2	15.4	2.0	14.0	3.1
		1.0	0.2	9.9g	1.5	9.6	3
9.2g	2mL	0.93	0.4	1.5g	1.5	3.6	1.8
12.7g	5mL	2.54	1.0			1.6	0.5

Mass

m³)

E		F		G		H	
Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)
4.3	1.5	3.19	2	1.2	0.1	1.0	0.2
0.5	0.2	1.14	0.5	3.5	0.4	1.6	0.2
2.8	1.9	4.3	1.6	0.6	0.1	14.4	2.0
16.5	3.2	2.6	1.5	2.0	0.3	9.3	0.8
4.3g	1.5			0.6	7.14	1.15g	10.5

Average Vol & Mass Period 2

Average Vol. & Mass Period 2

		B		C		D		cm ³)
Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	
9.2	4.0	254g	1.0cm ³	38.9	4.0	16.0	4.0	
221.0	10.0	5.9g	2.1cm ³	15.5g	2.0cm ³	13.4	2.8	
3.4	2.0	0.6g	0.1			9.5	2.0	
9.2	2.0	1.46	0.3	52.2g	5.2	4.1g	3.0cm ³	
41.6	18.0	1.44	0.6	122.8g	15	15.6g	3.0cm ³	
E		F		G		H		cm ³)
Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	
13.6	5.3	3.39	1.1	112.3	15.0	1.9	1.5	
8.6g	6cm ³	19.96	9.6	1.2	0.2	16.5	2.0	
5.1g	3.0cm ³	6.72	0.6	0.2	0.1	0.4g	0.1cm ³	
11.2g	5.0cm ³	10.99	3.1	111.9	10.1	10.2g	0.7cm ³	
				3.5g	1.0cm ³			

Average Vol. & Mass Period 3

		B		C		D	
Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)
27.7g	7.0 cm ³	0.84g	0.3 cm ³	13.10g	1.5 mL	16.0g	3.0 cm ³
1.4g	0.9 cm ³	4.84g	1.4 cm ³	28.5g	3.2 mL	1.3g	0.10 cm ³
9.2g	4 cm ³	24.74g	10 cm ³	7.2g	0.9 cm ³	25.5g	6.3 mL
27.6g	12 cm ³	2.58	1.0	23g	0.6 cm ³	15.2g	4.1 mL
9.2g	1 cm ³					16.0g	4 mL
36.9g	16 cm ³					9.5g	2 mL
		F		G		H	
Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)	Mass (g)	Vol. (cm ³)
10.2g	7.8 mL	13.31g	4.5 cm ³	1.8g	0.1 mL	16.3g	4.1 cm ³
7.6g	5.0 mL	42.91g	15 cm ³	5.7g	0.4 mL	44.9g	5.5 cm ³
4.3g	1.6 cm ³	14.13g	4.8 cm ³	8.3g	83. cm ³	23g	8.2 cm ³
1.5g	1 cm ³	10.99	3.1	3.5	1.0	10.2	0.7
2.0g	1 cm ³						
9.3g	3.5 cm ³						

Before you leave...

What laboratory tool could you use to find the volume of a metal nut?

How would you carry out the measurement?

What should you be sure to do to insure the volume is measured correctly?



When finished record data on board for class to copy down for graphs.

Email graph to: william.golden@fwusd.org

Subject: P.X.LastName.FirstName.Density

Recap

What did we do in the lab Friday day?

What two (2) measurements did we make?

Intensive property: Independent of the quantity or amount (Melting point, density, Molar Mass, etc.)

Extensive property: Depends on the amount. (Mass, volume, temperature, measurements)

Bell work

6-Sept-2016

- A. Fill the computer closest to door first
- B. Log on to a computer and go to the class website.
- C. Once there get out your Density Lab handout and data.

EQ: Suppose there are three parts to learning in school; student, teacher, and content/material. What is your role as a student including responsibilities and expectations

Agenda:

Use data from density lab to develop a series of line graphs on excel which show density as slope

Actual Density Values for percent Error

A: CuSO_4 8.05g/cm³ E: Granit 2.7 g/cm³

B: Al 2.7g/cm³

F: Fluorite g/cm³

C: Ni 8.90g/cm³

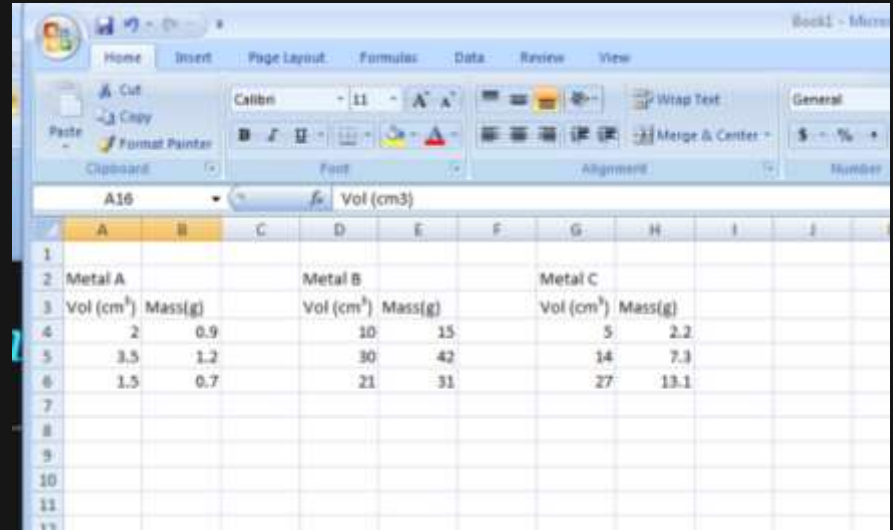
G: Cu 8.96g/cm³

D: FeS_2 5.02g/cm³

H: Pb 11.34g/cm³

Making your Graph

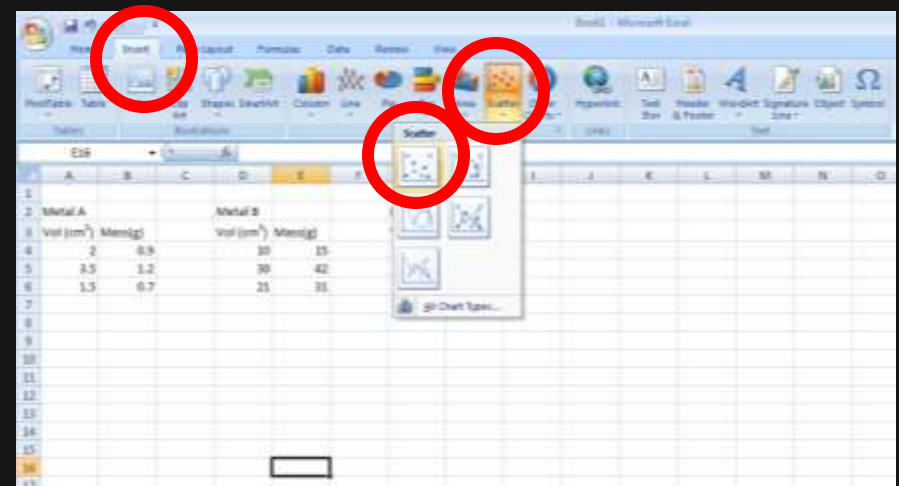
1. Enter you data in the spread sheet.



A screenshot of the Microsoft Excel interface. The 'Home' tab is selected. The active cell is A16, containing the formula '=Vol (cm3)'. The spreadsheet contains data for three metals: Metal A, Metal B, and Metal C. The data is organized into columns for Volume (cm³) and Mass (g).

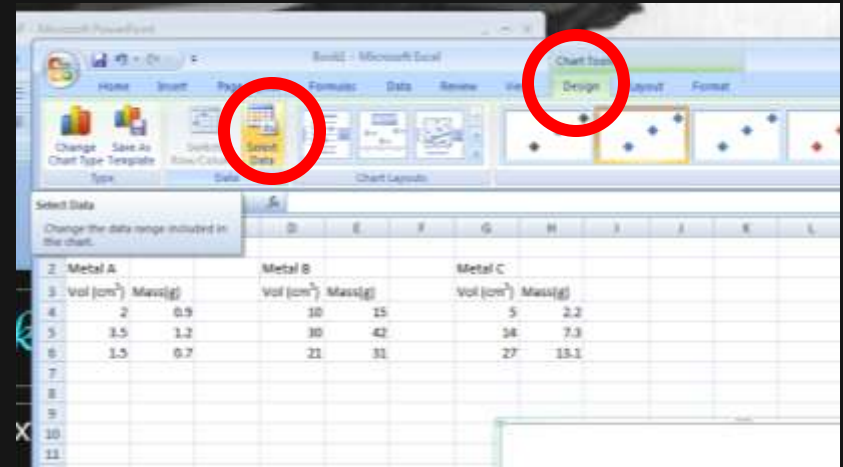
	Metal A		Metal B		Metal C	
	Vol (cm³)	Mass(g)	Vol (cm³)	Mass(g)	Vol (cm³)	Mass(g)
2	2	0.9	10	15	5	2.2
3	3.5	1.2	30	42	14	7.3
4	1.5	0.7	21	31	27	13.1

2. Go to the "Insert" tab and select "Scatter"

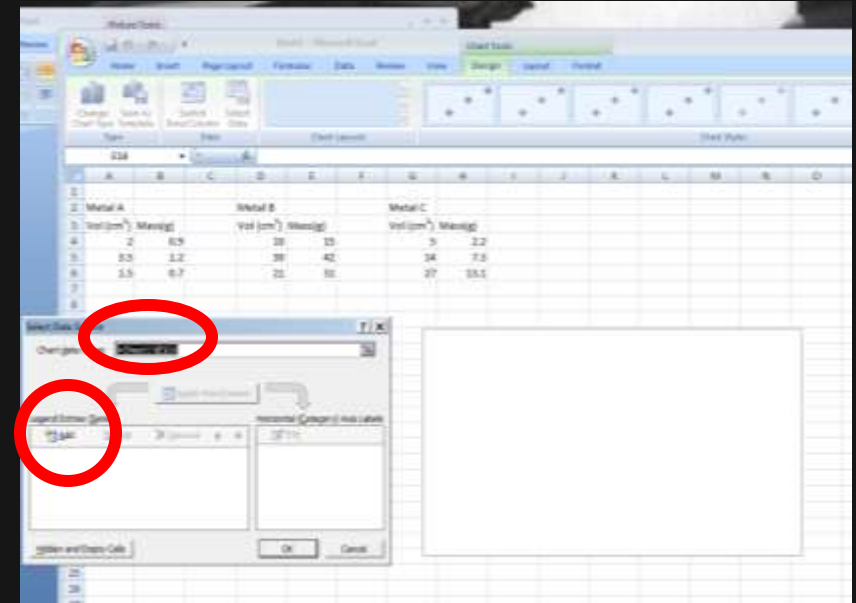


Graph Cont. 2

3. Select "Design" then "Switch Data"

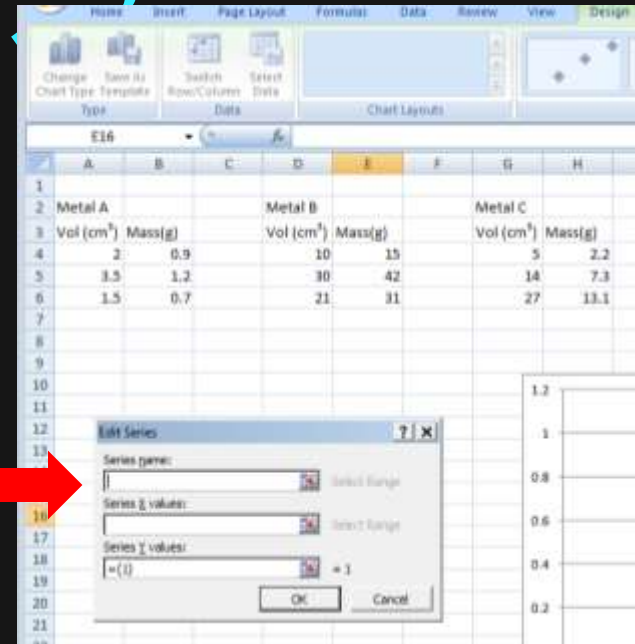


4. Clear Chart Range, and click "Add"

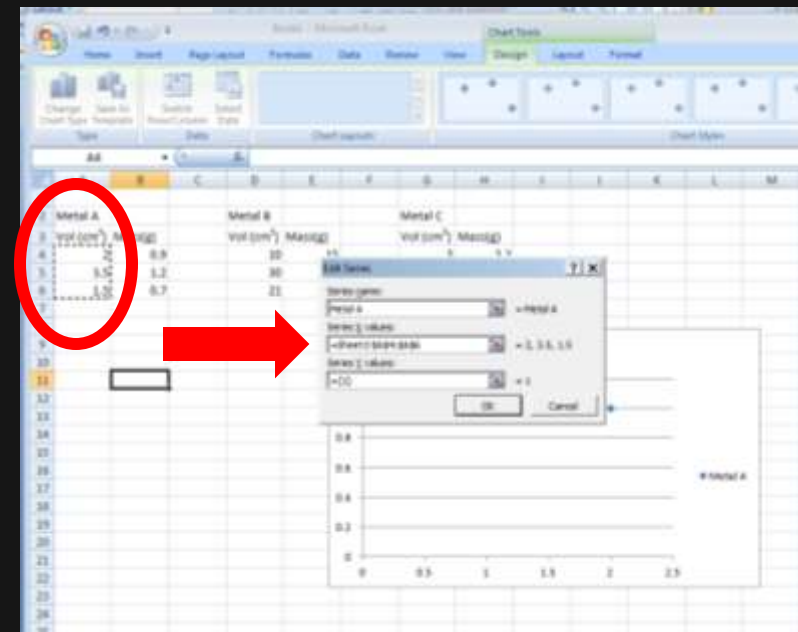


Graph Cont.

5. Type in Series name

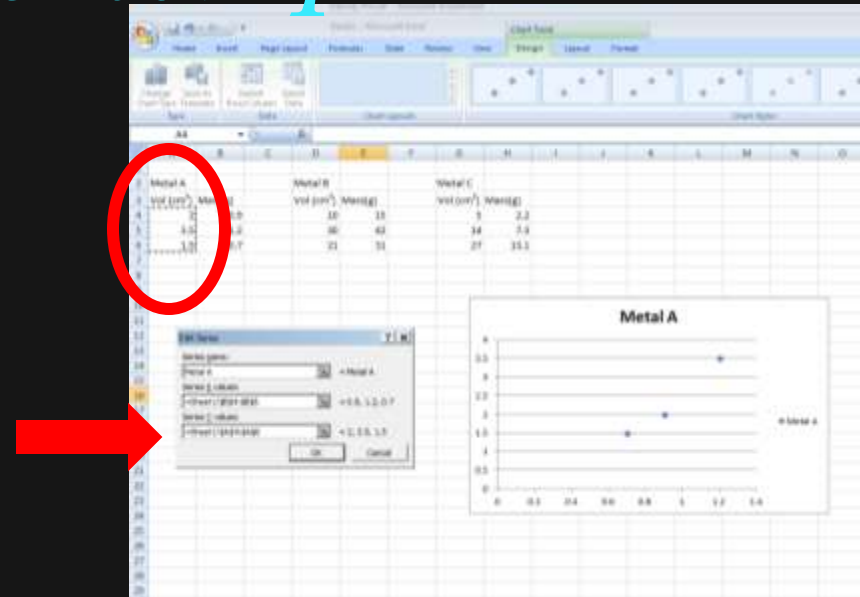


6. Click in "Series X values" and then highlight the x-axis data for metal A

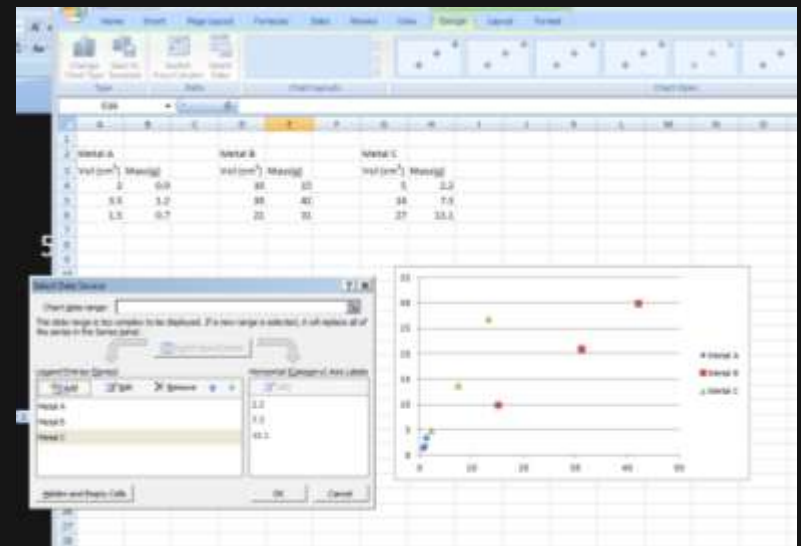


Graph Cont. 4

5. Click in "Series Y values" and, delete " $=\{1\}$ " then high light the y-axis data for metal A



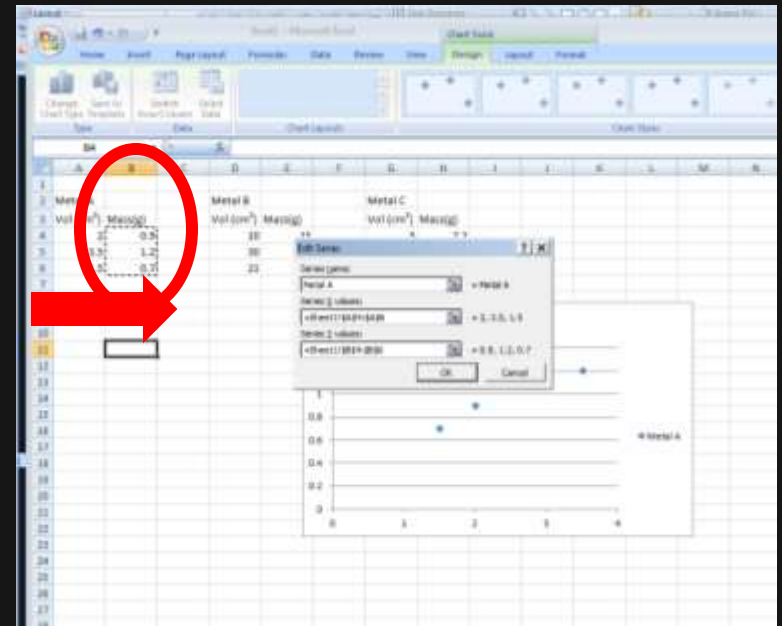
6. Repeat steps 4-6 for each metal



Graph Cont. 5

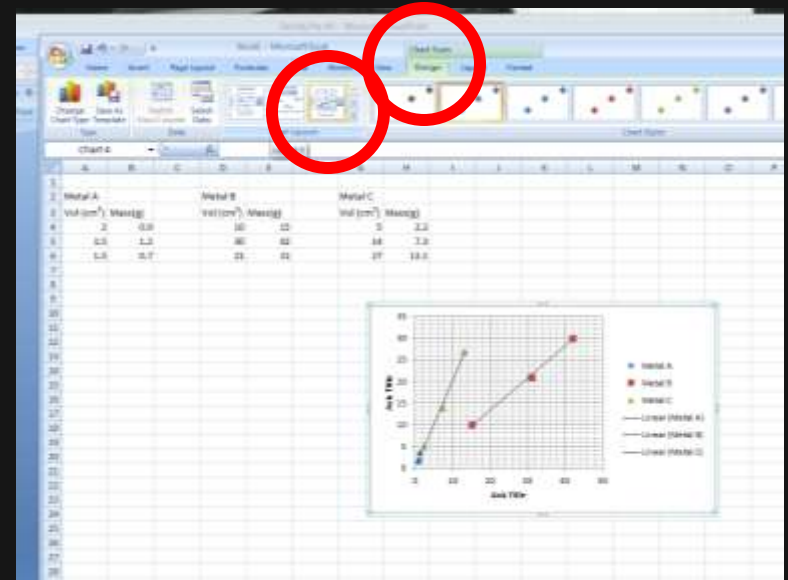
5. Click in "Series Y values" and then highlight the y-axis data for metal A

6. Repeat steps 4-6 for each metal



Graph Cont. 6

7. Click on chart then "design", and pick "layout 3"



8. Fill in Axis titles and Chart title, you can calculate slope manually Or using excel " $=\text{SLOPE}()$ " formula

Email Your Graphing

Save as: PX.Lastname.Firstname.Density

Email graph to: william.golden@fwusd.org

Subject: PX.Lastname.Firstname.Density



Must be in exact form or No credit.

Each person needs to send graphs

Due by 4:00pm Tuesday 8-Sept-2016

Bell work

7-Sept-2016

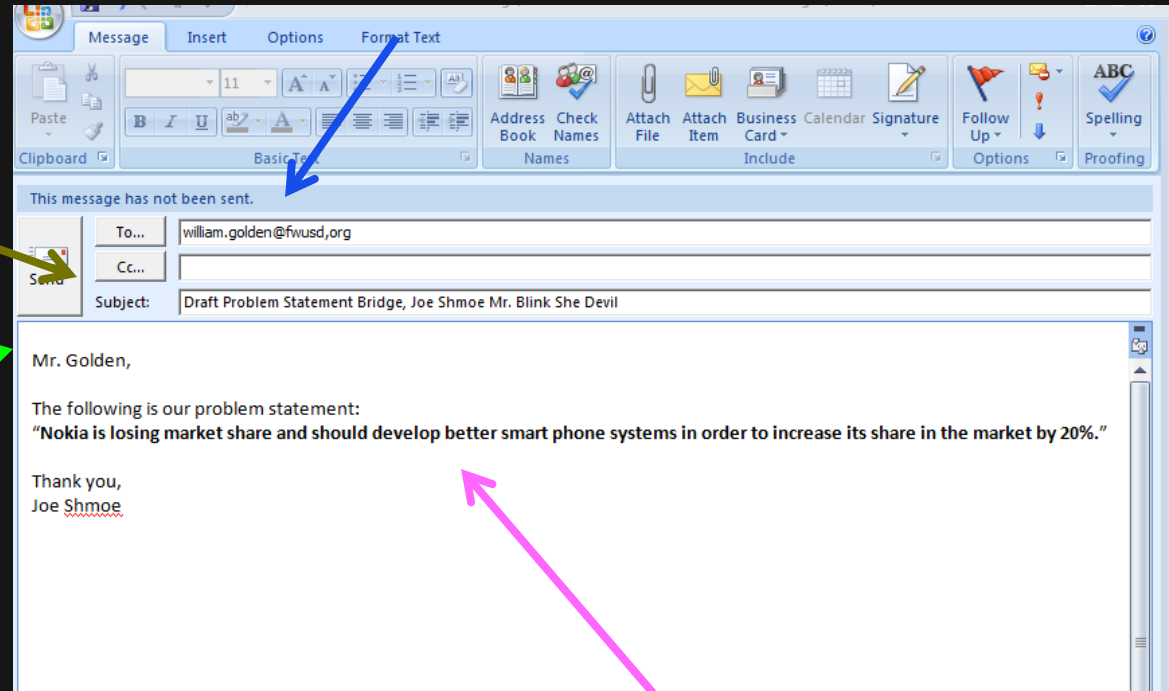
If a clay brick measures **20.0cm x 10.0cm x 10cm**,
what is the volume of the brick, in **mm³**?



Email Format

william.golden@fwusd.org

Subject line: "Draft Problem Statement Bridge, Names of group members."



**Salutation/
Greeting,**

**Complementary
Closure and
name**

**Content, Problem
Statement in
message**

For Gmail same piece
different set up.

Gmail Format

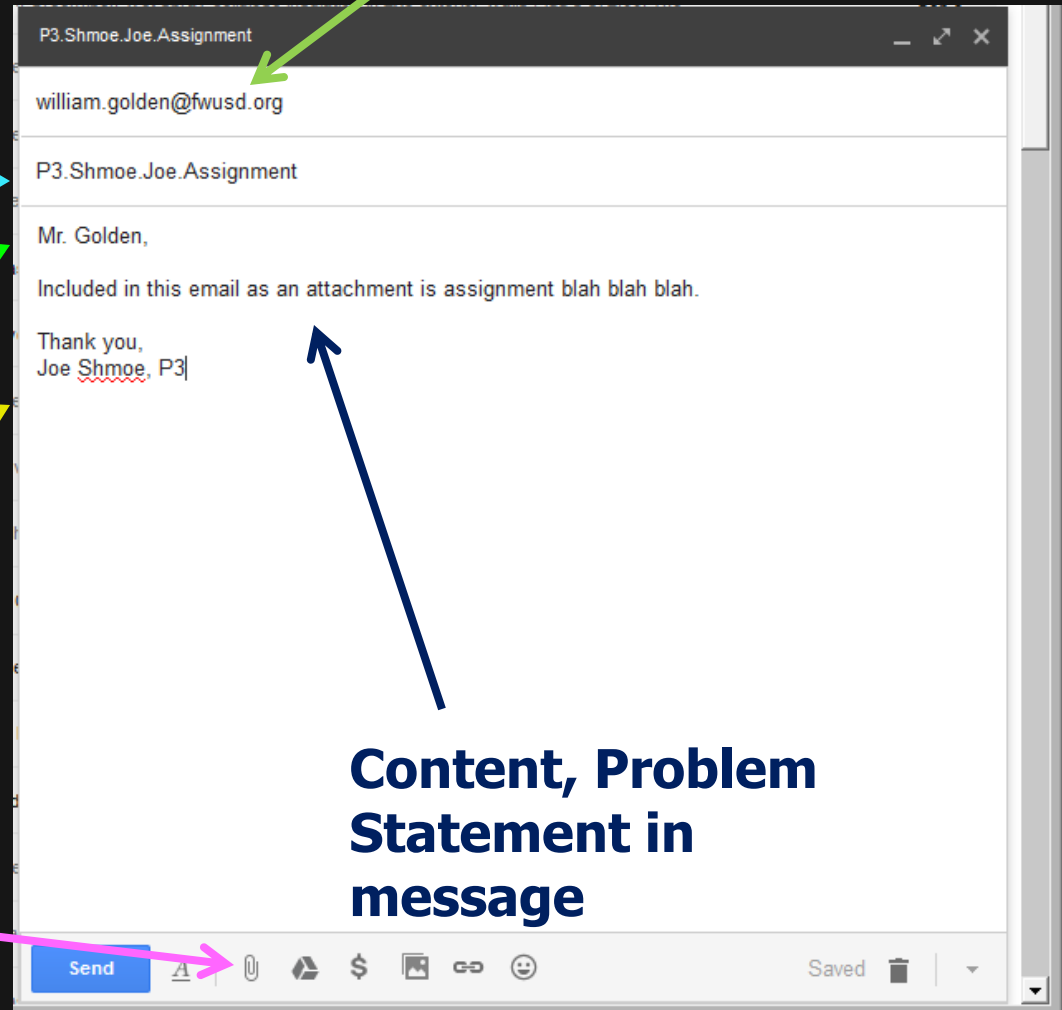
Subject line: "Draft Problem Statement Bridge, Names of group members."

**Salutation/
Greeting,**

**Complementary
Closure and
name**

**Complementary
Closure and
name**

william.golden@fwusd.org



**Content, Problem
Statement in
message**

Email Your Graphing

Save as: PX.Lastname.Firstname.Density

Email graph to: william.golden@fwusd.org

Subject: PX.Lastname.Firstname.Density



Must be in exact form or No credit.

Each person needs to send graphs

Due by 4:00pm Tuesday 8-Sept-2016

Bell Work

8-Sept-2016

What is the mass (g and lb) of a bar of lead below with dimensions of base 1 50.0 mm, base 2 28.0mm with a height of 45.0mm, a width of 200.mm. The density of lead =11.35g/cm³ and can be found in the back of your text book.



$$Vol_{trap} = \frac{h(b_1 + b_2)}{2} \times w$$

EQ: Suppose there are three parts to learning in school; student, teacher, and content/material. What is your role as a student including responsibilities and expectations

Objective

You will be able to
explain the concept of density correctly using
the words mass, volume and weight and
manipulate mass, volume, and/ or density to
find an unknown value.

Density

Density compares the mass of an object to its volume

$$D = \frac{\text{mass}}{\text{volume}} = \frac{\text{g}}{\text{ml}} = \frac{\text{g}}{\text{cm}^3}$$

Note: 1 mL = 1 cm³



Density Vocabulary

Weight is a measure of the gravitational force on an object.

Volume is the amount of space an object occupies

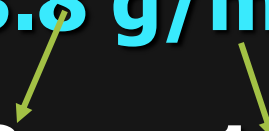
Mass is the amount of matter which occupies a given space.

Density as Conversion Factors

A substance has a density of 3.8 g/mL.

Density = 3.8 g/mL

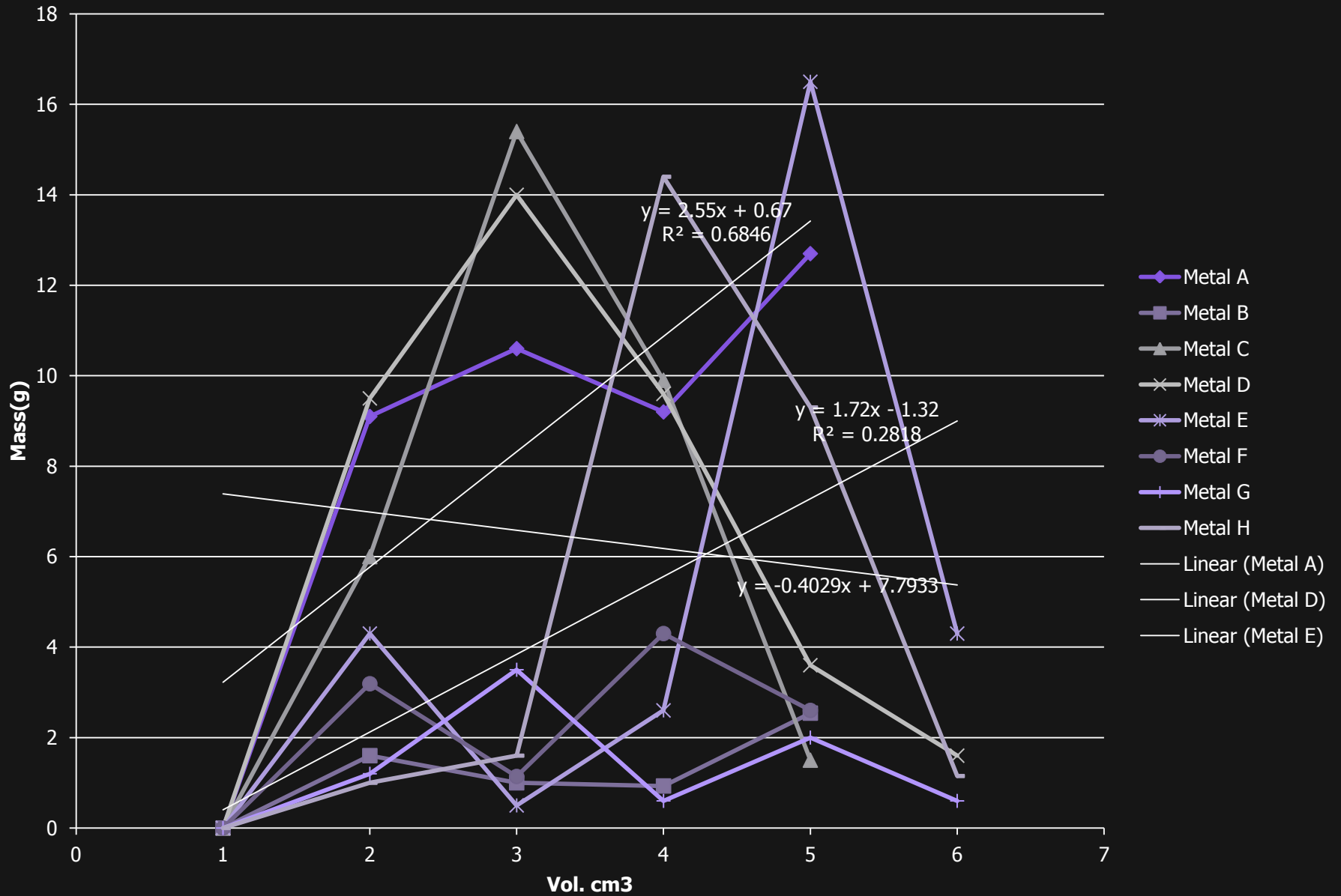
Equality 3.8 g = 1 mL



Conversion factors.

$$\frac{\underline{3.8 \text{ g}}}{1 \text{ mL}} \quad \text{and} \quad \frac{\underline{1 \text{ mL}}}{3.8 \text{ g}}$$

Desity lab p.1



Density Connections

Mass

kg



g



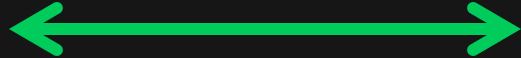
mg

Volume

L

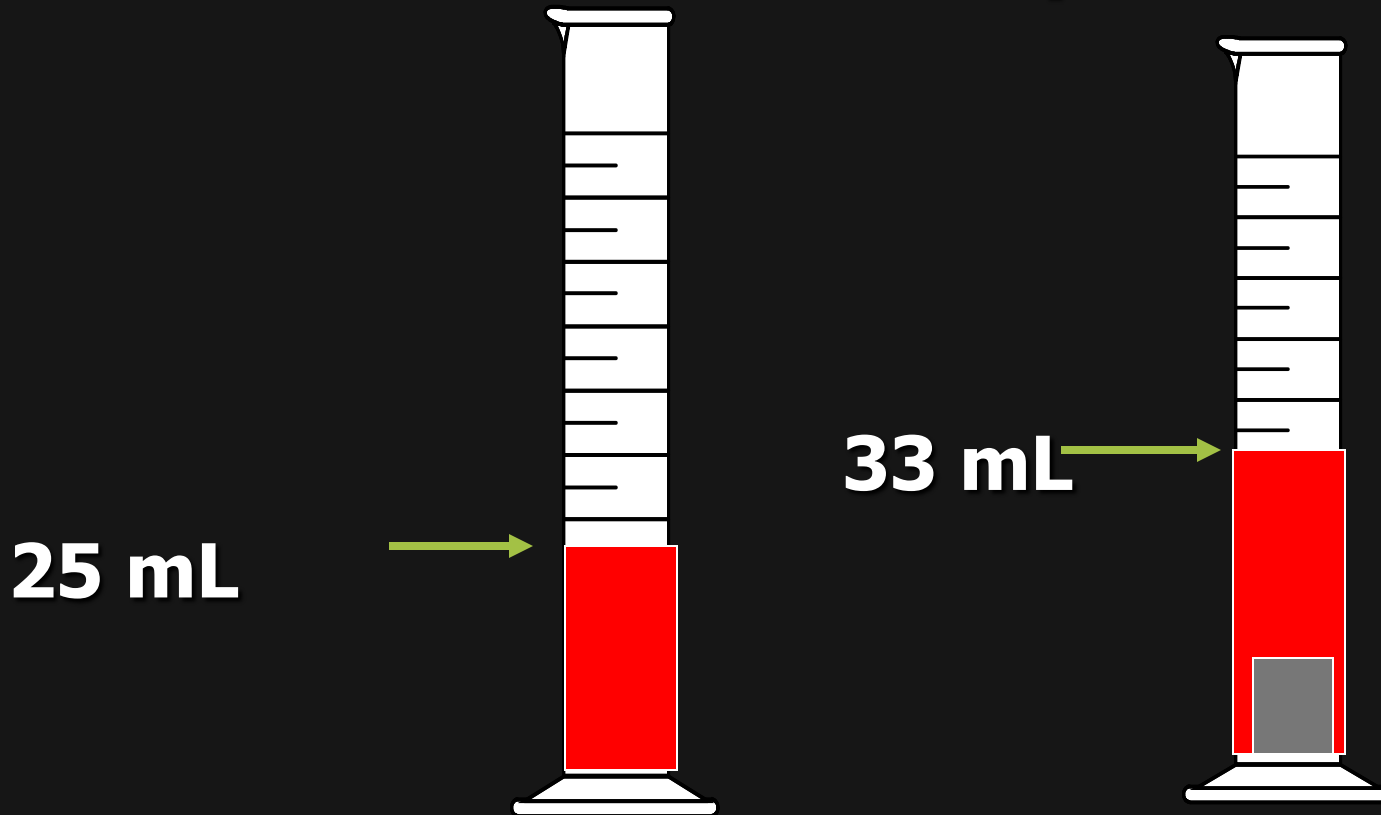


mL (cm³)



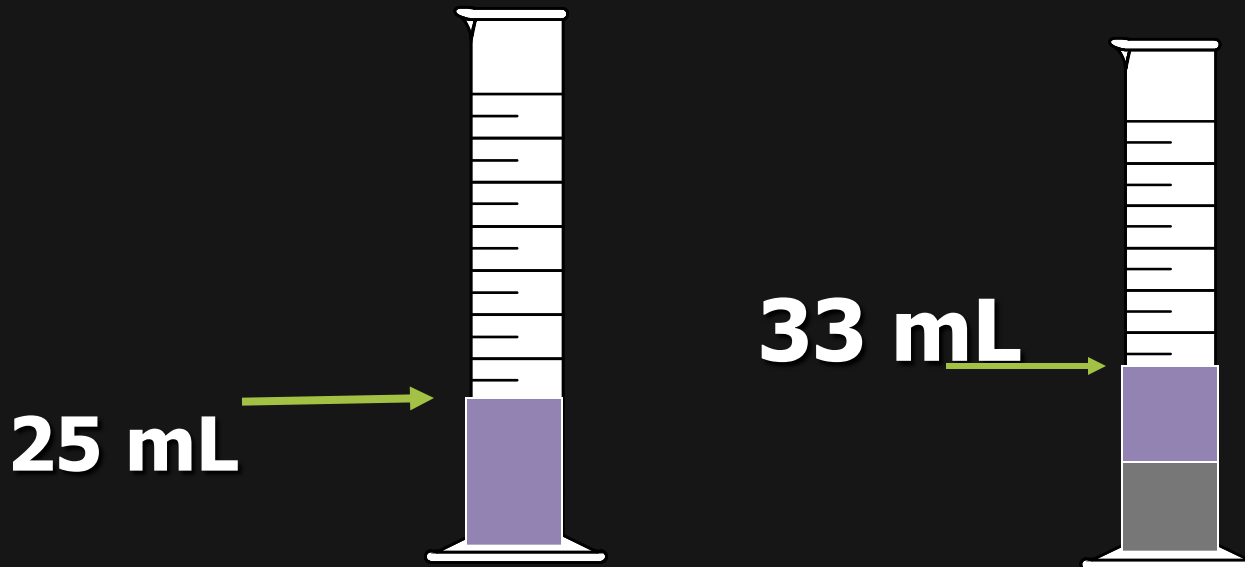
Volume Displacement

A solid displaces a matching volume of water when the solid is placed in water.



Practice

What is the density (g/cm^3) of 48 g of a metal if the metal raises the level of water in a graduated cylinder from 25 mL to 33 mL? **A) $0.2 \text{ g}/\text{cm}^3$** **B) $6 \text{ g}/\text{cm}^3$** **C) $252 \text{ g}/\text{cm}^3$**



Solution

B) 6 g/cm³

Volume (mL) of water displaced

$$= 33 \text{ mL} - 25 \text{ mL} = 8 \text{ mL}$$

Volume of metal (cm³)

$$= 8 \text{ mL} \times \frac{1 \text{ cm}^3}{1 \text{ mL}} = 8 \text{ cm}^3$$

Density of metal =

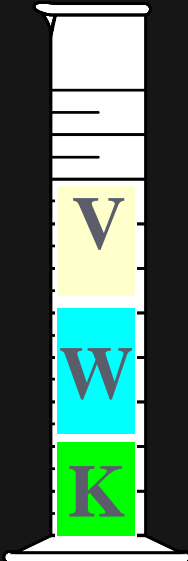
$$\frac{\text{mass}}{\text{volume}} = \frac{48 \text{ g}}{8 \text{ cm}^3} = 6 \text{ g/cm}^3$$

Practice

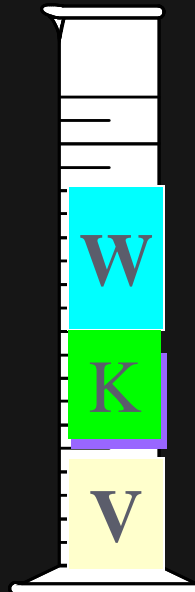
Which diagram represents the liquid layers in the cylinder?

(K) Karo syrup (1.4 g/mL), (V) vegetable oil (0.91 g/mL,) (W) water (1.0 g/mL)

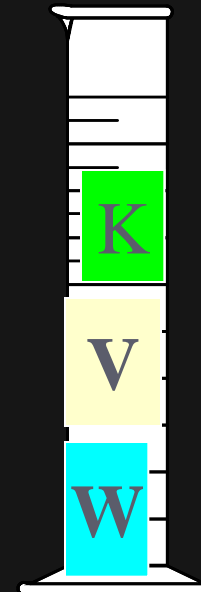
1)



2)



3)



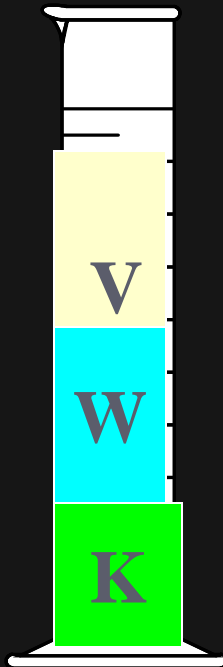
Solution

1)

(V) vegetable oil (0.91 g/mL),

(W) water (1.0 g/mL)

(K) Karo syrup (1.4 g/mL),



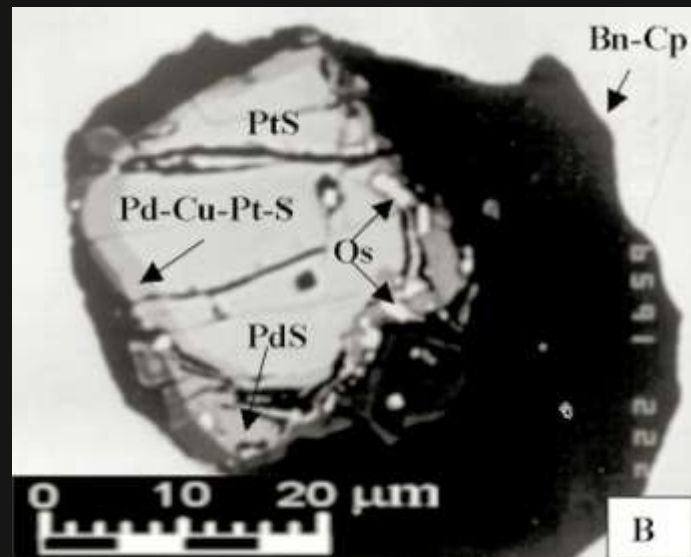
Practice

Osmium is a very dense metal. What is its density in g/cm^3 if 50.00 g of the metal occupies a volume of 2.22cm^3 ?

1) $2.25\text{ g}/\text{cm}^3$

2) $22.5\text{ g}/\text{cm}^3$

3) $111\text{ g}/\text{cm}^3$



Solution

2) Placing the mass and volume of the osmium metal into the density setup, we obtain

$$D = \frac{\text{mass}}{\text{volume}} \rightarrow \frac{50.00 \text{ g}}{2.22 \text{ cm}^3} \rightarrow$$

$$\rightarrow 22.522522 \text{ g/cm}^3 \rightarrow 22.5 \text{ g/cm}^3$$

Density, a Visual Explanation

100g popcorn kernels 100g popped popcorn

a. Which bag has a greater volume of popcorn?

The popped kernels have a larger volume than the unpopped kernels.

b. Which type of popcorn is more dense?

The unpopped kernels.

c. Which bag has a greater mass?

Both bags have the same mass.

d. Which bag weighs the most?

Both bags weigh the same.

Density, a Visual Explanation cont.

Using the following three words; density, mass, and volume, describe why the bag of kernels is more dense then the popped bag.

Complete sentences, correct use of words is necessary.

Closure

What is the percent error in the results of the following measurement: Outside air temp was found to be 29.3°C but was actually 30.04°C.

Hint: $\frac{| \text{Actual value} - \text{your value} |}{\text{Actual value}} \times 100\%$

Bell Work

8-Sept-2016

A: If an empty 125mL glass flask weighs 75g and when filled with water weighs 200g, what is the mass of the water? (plan out what to do 1st)



B: What is the density of the water?

EQ: Suppose there are three parts to learning in school; student, teacher, and content/material. What is your role as a student including responsibilities and expectations

Objective

You will be able to
manipulate mass, volume, and/ or density to
find an unknown values at different units.

Step by Step

After crossing a bridge in your car you come up to a massive concrete block obstructing your view, if the block has a volume of 15m^3 and a mass of $4\,500\text{ kg}$. What is its density in g/L ?



Step by Step

After crossing a bridge in your car you come up to a massive concrete block obstructing your view, if the block has a volume of 15m^3 and a mass of $4\,500\text{ kg}$. What is its density in g/L ?

$$\frac{4\,500\text{ kg}}{15\text{ m}^3} \times \frac{1\text{ m}^3}{1\,000\text{ dm}^3} \times \frac{1\text{ dm}^3}{1\text{ L}} \times \frac{1\,000\text{ g}}{1\text{ kg}} = 300\text{ g/L}$$

Learning Check



A group of students collected 125 empty aluminum cans to take to the recycling center. If 21 cans make 454 grams of aluminum, how many liters of aluminum ($D=2.70 \text{ g/cm}^3$) are obtained from the cans?

A) 1.0 L B) 2.0 L C) 4.0 L

Solution

A) 1.0 L

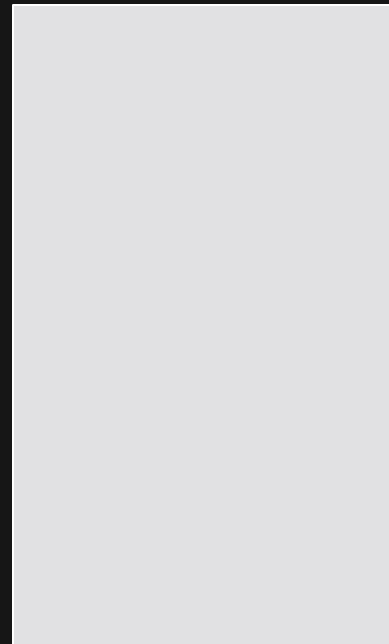
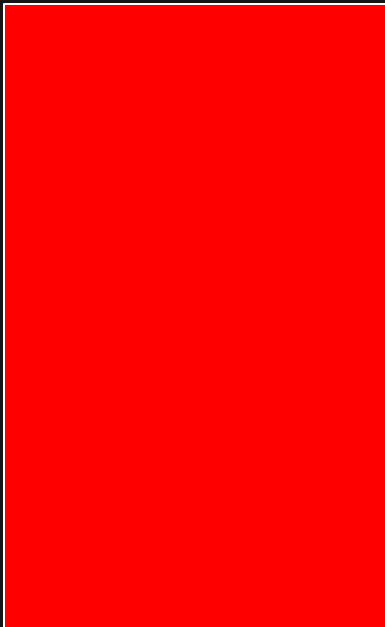


$$125 \text{ cans} \times \frac{454 \text{ g}}{21 \text{ cans}} \times \frac{1 \text{ cm}^3}{2.70 \text{ g}} \times \frac{1 \text{ mL}}{1 \text{ cm}^3} \times \frac{1 \text{ L}}{1000 \text{ mL}} =$$

1.0 L

Why Does it not Float?

Explain why Diet Coke floats and Coke sinks using the vocab you learned yesterday



“Density Practice Problems”

Complete ALL Work on a separate sheet of paper.
The provided example should be followed. You
WILL NOT RECEIVE credit if dimensional
analysis is not used 😊